

CLAIMS

What is claimed is:

1. A physical property sensor die, comprising:
 1. a substantially solid insulating sensor body having a front surface and a back surface, wherein the substrate has a plurality of openings extending from the front surface to the back surface;
 2. at least one sensing element coupled to the front surface; and
 3. a connection material filling the plurality of openings such that the plurality of sensing elements are electrically connected to corresponding connection material on the back surface, and the connection material is configured to accommodate connection of the connection material to an electronics substrate.
2. The physical property sensor die of claim 1 wherein the at least one sensing element includes a heater and a thermal sensor.
3. The physical property sensor die of claim 1 wherein the at least one sensing element includes a temperature sensor.
4. The physical property sensor die of claim 1 wherein the at least one sensing element includes an environmental sensor.
5. The physical property sensor die of claim 1 wherein the at least one sensing element include a heater, a first thermal sensor, and a second thermal sensor.
6. The physical property sensor die of claim 1 wherein the sensor body is made up of a photosensitive glass.
7. The physical property sensor die of claim 1 wherein the sensor body is made up of a ceramic.
8. The physical property sensor die of claim 1 wherein the sensor body is made up of a highly melting glass.
9. The physical property sensor of claim 1 wherein the sensor body is highly insulating silicon.
10. The physical property sensor die of claim 7 wherein the ceramic is alumina.

1 11. The physical property sensor die of claim 8 wherein the ceramic is highly melting glass is
2 fused silica.

1 12. The physical property sensor die of claim 6 wherein the photosensitive glass is Foturan.

1 13. The physical property sensor die of claim 1 wherein the plurality of sensing elements are
2 constructed of platinum coated on the front surface.

1 14. The physical property sensor die of claim 1 wherein the substantially solid sensor body is
2 made up of a first material and a second material, wherein the first material is positioned directly
3 below the plurality of sensing elements.

1 15. The physical property sensor die of claim 1 wherein the substantially solid sensor body
2 includes a plug made of a first material positioned below the plurality of sensing elements, the
3 plug being surrounded by a second material which makes up the remainder of the substantially
4 solid sensor body.

1 16. The physical property sensor die of claim 15 wherein the plug is substantially cylindrical.

1 17. The physical property sensor die of claim 14 wherein the first material is glass and the
2 second material is alumina.

1 18. The physical property sensor die of claim 15 wherein the first material is glass and the
2 second material is alumina.

1 19. A sensor for measuring physical properties of a fluid adapted to be attached to a sensing
2 circuit, the sensor comprising;

3 a sensor die made up of a substantially solid insulating sensor body and a plurality of
4 sensing elements, wherein the plurality of sensing elements are positioned on a
5 front surface of the substrate and are in communication with a plurality of die vias
6 to allow electrical signals to be transmitted to a back surface of the substrate, the
7 back surface being opposite the front surface and substantially parallel thereto;
8 and

9 a sensor substrate attached to the sensor die in juxtaposition with the back surface, the
10 sensor substrate configured for further attachment to the sensing circuit through a
11 plurality of substrate vias, the substrate vias being in contact with the die vias to
12 allow electrical contact to the sensing circuit.

- 1 20. The sensor of claim 19 further comprising a passivation layer covering the sensing
- 2 elements.
- 1 21. The sensor of claim 20 wherein the passivation layer is silicon nitride.
- 1 22. The sensor of claim 19 wherein the plurality of sensing elements include a heater and a
- 2 thermal sensor.
- 1 23. The sensor of claim 19 wherein the plurality of sensing elements include a heater, a first
- 2 thermal sensor and a second thermal sensor.
- 1 24. The sensor of claim 19 wherein the sensor body is fabricated from a photosensitive glass.
- 1 25. The sensor of claim 20 wherein the sensing elements are platinum structures coated on
- 2 the first major surface of the sensor body and are covered by the passivation layer.
- 1 26. The sensor of claim 19 wherein the vias include holes in the sensor body extending from
- 2 the front surface to the back surface.
- 1 27. The sensor of claim 19 further comprising a plurality of interconnect structures
- 2 positioned on the sensor body and in communication with the die vias to provide appropriate
- 3 interconnection for the sensing elements.
- 1 28. The sensor of claim 19 wherein the sensor body includes a plug of a first material
- 2 positioned beneath the sensing elements and a second material making up the remainder of the
- 3 substrate and surrounding the plug.
- 1 29. The sensor of claim 28 wherein the first material is glass and the second material is
- 2 alumina.
- 1 30. A method for creating a glass based property sensor, comprising:
2 masking a glass die substrate using a mask having a predetermined masking pattern,
3 wherein the mask is made of a material to selectively block predetermined light
4 signals;
5 irradiating the masked glass die substrate so as to expose the unmasked portions of the
6 glass die substrate;
7 annealing the glass die substrate so as to remove the mask and crystallize those portions
8 of the glass die substrate that were not covered by the mask;
9 etching the crystallized portions of the glass substrate; and

10 coating predetermined areas of the glass die substrate with a conductive material so as to
11 provide conductive pathways for electrical signals.

1 31. The method of claim 30 wherein the step of etching provides holes extending from a
2 front side of the substrate through the entire back side of the substrate.

1 32. The method of claim 30 wherein the holes make up vias for providing electrical contact
2 communication points through the glass die substrate.

Ado
Bl7

Ado
C2

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100